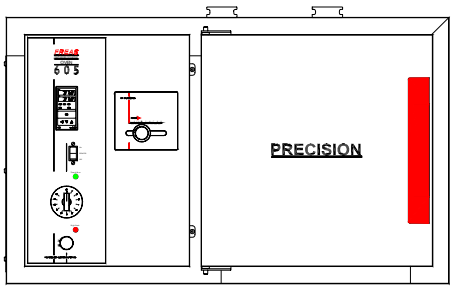
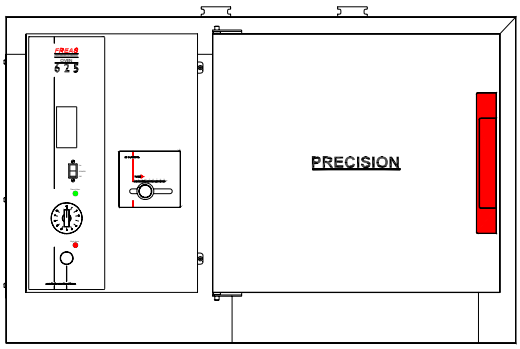
Thermo
ELECTRON CORPORATION

Installation/Service Manual

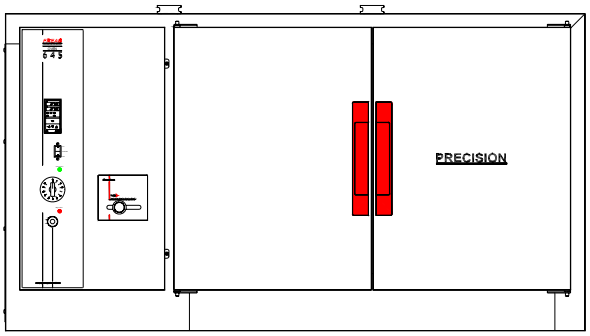
Freas Microprocessor-Controlled Ovens



Model 605 (6050/6051)
Model 605P (6052/6053)



Model 625 (6054)



Model 645 (6056)

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REVISION STATUS

INDEX	DATE	AMENDED PAGES	NOTES
A			Initial release (new aesthetics)
B	11/01	6	Add "plastics may melt" blurb to caution note
C	6/05	36100132(34001700)	new manual #, manufacture location
D	6/06	ECR 23496	updated elec specs to UL report

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Introduction

Your satisfaction and safety are important to Thermo and a complete understanding of this unit is necessary to attain these objectives.

As the ultimate user of the apparatus, it is your responsibility to understand its proper function and operational characteristics. This instruction manual should be thoroughly read and all operators should be given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters -- together with maintenance requirements are important for safety and satisfactory operation. The unit should be used for its intended application; alterations or modifications will void the Warranty.

WARNING

AS A ROUTINE LABORATORY PRECAUTION, ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH THIS APPARATUS.

This product is not intended, nor can it be used, as a sterile or patient-connected device. In addition, this apparatus is not designed for use in Class I, II or III locations as defined by the National Electrical Code.

Unpacking and Damage

Save all packing material if apparatus is received damaged. This merchandise was carefully packed and thoroughly inspected before leaving our factory.

Responsibility for its safe delivery was assumed by the carrier upon acceptance of this shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

Visible Loss or Damage:

Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such a claim will be supplied by the carrier.

Concealed Loss or Damage:

Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by the carrier's agent within 15 days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

By following these instructions carefully, we guarantee our full support of your claim to be compensated for loss from concealed damage.

DO NOT — FOR ANY REASON — RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to Thermo, please supply the nameplate data, including catalog number and serial number.

General Information

This instruction manual encompasses the following models and their specific electrical characteristics.

Model No.	Catalog No.	Volts	Hz	Phase	Total Watts	Total Amps	Blower Motor	Maximum Rated Temp (in °C)
6050/6051 6052/6053	3166777	120	50/60	1	2500	20.8	1/6 H.P.	325
	3166778	230	50/60	1	2500	11	1/6 H.P.	325
6054	3166779	230	50/60	1	3700	16	1/6 H.P.	325
6056	3166780	230	50/60	1	4800	21	1/6 H.P.	325

These ovens utilize a motor driven turbo blower to circulate heated air throughout the working chamber. In operation, air is drawn into the chamber through an intake port located at the left side of oven top, passed over the heater bank where it is heated and forced into the working chamber through a perforated panel known as a diffuser wall located on the right hand side of the chamber. The air then passes across the working chamber and out through a diffuser wall on the opposite side where it is again passed over the heater bank and recirculated. During this continuous process, a portion of the heated air is exhausted through a vent located at the top of the working chamber to eliminate moisture and fumes which may arise from the material in the oven. The exhausted air is replaced by new air being drawn in through the intake port.

Mechanical Convection Ovens provide the most efficient means of heat transfer as well as the most reproducible test conditions for successive operations. They provide rapid heat-up time for high density loads, shortened recovery period in production operations where the door is frequently opened, and a minimum difference in uniformity for extremely heat sensitive materials. These ovens are microprocessor controlled. The temperature range of the oven is ambient +15°C minimum to 325°C maximum.

These controllers cycle heat "On/Off" in split-second intervals based on input from a Platinum Resistance Temperature Device (RTD) sensor. The controller displays temperature in °C. When this type of control is combined with the appropriate inner chamber design, precise temperature control from ambient +15°C to 325°C is achieved.

Another backup - safety, is a separate adjustable "HIGH LIMIT" control which turns the heater "Off", if the selected limit is attained. A glowing red light will indicate this condition.

The timer, located on the front panel, is spring wound. It will allow the heater to be turned "Off" after a preset time (maximum of 12 hours) or to continue to heat at the desired chamber temperature by turning the timer knob to the "HOLD" position.

The air continues to circulate within the chamber after the heater is turned "Off" as the blower motor is still operating.

Installation

WARNING

INSTALLATION SHOULD BE COMPLETED BY QUALIFIED PERSONNEL ONLY.

Oven Location:

Best operating results are obtained by choosing a location as free as possible from dust, drafts, or severe temperature changes which can affect the performance of the oven. All four legs of the oven are adjustable to compensate for unevenness of the installation site.

An electrical source of proper characteristics should be near at hand. The ambient temperature should be between 10° and 40°C. Allow if possible, 1-5 feet of free space from left oven wall. This space will allow easy access to the electrical compartment of the oven for maintenance. In any case, 6 inches of free space should be provided for proper ventilation of the electrical compartment.

Electrical Connections: Important (Please read carefully).

WARNING

FOR PERSONAL SAFETY, THIS APPARATUS MUST BE PROPERLY GROUND.

All models are supplied with a junction box located on the rear of the oven. The National Electrical Code must be observed for proper fusing and size of service wires. Electrical power must be supplied to the oven with permanent wire connections as a line cord is not provided. The service wires should be connected to the three conductors inside the junction box by a QUALIFIED ELECTRICIAN. The green conductor furnished with the oven must be connected to a well grounded conduit/system.

The electrical ratings for each model are printed on the nameplate attached to the oven.

Electrical Connection Check Points:

1. Have proper connections been made at the junction box?
2. Are all wire connections tight?
3. Are service wires size adequate to carry the load?
4. Is the oven properly grounded?
5. Is the oven connected to a properly fused branch circuit?

Explanation of Controls

"Power" Switch:

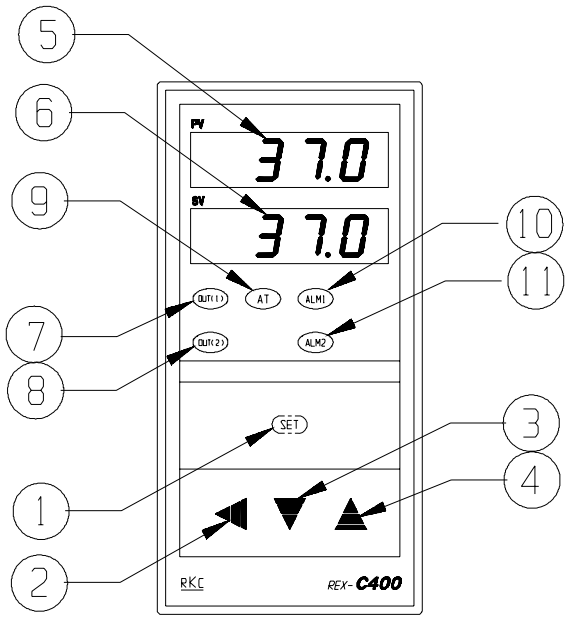
Controls all electrical power to the oven when energized. The blower motor will always be in operation when the "Power" switch is "On".

"High Limit" Control:

The function of this thermostat is to control the operation of the heater if either the microprocessor or RTD should fail. During normal operation, the control is set so that the pilot lamp, above the control knob, does not glow. A glowing lamp indicates that the heater is not energized. When the control knob is rotated to its maximum position (fully clockwise), the maximum chamber temperature will be limited to 345°C.

"Temperature Control":

"TEMPERATURE" Controller: The microprocessor temperature controller provided contains two digital displays - the upper display indicates chamber temperature in °C and the lower display indicates the desired operating temperature in °C.



1. Set (SET) key is used to access the set values for Temperature Control.

2. Setting digit shift left key — moves to and highlights digit to be changed.

3. Set-value decrement key is used to decrease the value of the number highlighted.

4. Set-value increment key is used to increase the value of the number highlighted.

5. Present Value (PV) is the actual chamber temperature.

6. Set-value (SV) is the Temperature Set Value Display (setpoint or desired temperature).

7. First control output (OUT(1) lamp lights up when control output (heat) is turned ON.

8. Not Used

9. Not Used

10. Not Used

11. Not Used

"Timed Heat":

It is a 12-hour spring-wound timer with a "HOLD" feature. It turns off the heater after preset time of the timer has elapsed, but the blower motor stays energized and continues to circulate air through the chamber. During normal continuous operation of the oven at a desired temperature, the timer knob should be turned to "HOLD" position (counterclockwise).

"Air Volume Control":

It is a mechanical setting and controls the amount of heated air entering the working chamber. The reference dial is numbered 1 through 9. The setting is made by turning the knob slightly counterclockwise, sliding it to a desired position on the scale and locking it by turning clockwise. Although the scale is numbered linearly, the air volume increase is not linear. The air volume increases are relatively small at the lower end of the scale and large when adjusted at the upper end. The "one" setting on the scale provides the minimum airflow, and a setting of "nine" will supply the maximum airflow.

NOTE

THE AIR BLOWER OPERATES AT ALL TIMES WHEN THE "POWER" SWITCH IS "ON".

Operation

1. For nominal ventilation, open the exhaust vent and air intake vent shutter caps approximately 50%. The air intake vent is to the left when facing the front of the oven.

2. Set "Air volume" control to the midposition.

3. Turn the "High Limit" control fully clockwise.

4. Turn the "Timed Heat" knob to the "Hold" position for continuous operation at a desired temperature setting. If a controlled time period, up to 12 hours, is required, rotate the knob to the desired hourly increment.

NOTE

IF THE TIMER KNOB IS AT THE ZERO POSITION, THE HEATER WILL NOT OPERATE.

5. Press the "Power" switch to the "On" position and observe operation.

6. Depress the appropriate “UP” or “DOWN” button until the desired setpoint temperature is displayed in the lower display.

7. To set the temperature:
   - Press the SET key once. The right digit will flash.
   - Select a value for this digit by pressing the /\ or \/ key until the value is displayed.
   - Press the < key to select the next digit to be changed. Use the /\ or \/ key until the desired value is displayed.
   - Once the readout is displaying the desired temperature setpoint, press the SET key to enter the value into the controller.

8. Allow the chamber to stabilize at the select "SP" temperature which can be observed on the upper display [Time to reach maximum rated temperature (325°C) is approximately 60 minutes].

9. Set the "High Limit" thermostat by rotating the knob counterclockwise until the red pilot light turns "On". It indicates that the "High Limit" thermostat has taken control and that the heater has been de-energized. Once this occurs, rotate the knob clockwise one division.

NOTE

THIS ADJUSTMENT FOR THE "HIGH LIMIT" THERMOSTAT SHOULD BE DONE ONLY WHEN THE CHAMBER TEMPERATURE IS STABILIZED AT THE DESIRED SETPOINT TEMPERATURE.

WARNING

READ THE FOLLOWING SECTION (#10) COMPLETELY BEFORE ATTEMPTING TO PERFORM THE “CALIBRATION” PROCEDURE. THIS PROCEDURE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. FAILURE TO PERFORM THE CORRECT SEQUENCING AND OR INPUTTING MAY CAUSE A CHANGE ADVERSELY AFFECTING THE OPERATION OF THE UNIT.

10. Calibration/temperature offset: Calibration offset is used to match the actual displayed temperature to a thermometer that has been placed in the chamber.

    The difference between the reading on the display and the reading on the thermometer placed in the chamber is the **OFFSET VALUE**.

    To calibrate OFFSET:
    - Press and hold the SET key for 5 seconds. The display will show
    - Press the SET key until the display shows
    - Enter 0000
    - Press the SET key.
    - Simultaneously press and hold the SET and < keys for 5 seconds. The display will show
    - Press the SET key until the display shows
    - Note the offset value displayed and add or subtract the difference.
    - Enter the new value and press the SET key to lock the value in.
    - Turn the power OFF and back on to escape the setup routine.

Loading:

Mechanical convection ovens depend on forced air circulation, therefore, general loading procedures are applicable and must be followed. To insure that the circulation of heated air is not restricted in the chamber.

1. At least 1" should be left between objects placed on the shelves.

NOTE

IN MECHANICAL CONVECTION OVENS, OBJECTS SHOULD NOT BE PLACED ON SHELVES IN SUCH A MANNER AS TO BLOCK THE MOVEMENT OF HEATED AIR INTO THE CHAMBER FROM THE SIDE DIFFUSER PANEL.

2. The bottom of the chamber must be kept free and clear of objects.

3. At no time should solid shelves be substituted for the shelves that are provided.

WARNING SAFETY PRECAUTIONS

***DO NOT** PLACE ANY EXPLOSIVE, COMBUSTIBLE OR FLAMMABLE MATERIALS IN THE CHAMBER. **DO NOT** PLACE SEALED CONTAINERS IN THE CHAMBER. SEALED CONTAINERS, FILLED WITH MATERIALS, DO NOT PROVIDE ROOM FOR EXPANSION AND CAN DEVELOP DANGEROUS VAPOR PRESSURE AS THE TEMPERATURE INCREASES. **AVOID** SPILLAGE OF LIQUIDS. **DO NOT** EVAPORATE NOXIOUS FUMES.*

CAUTION

***DO NOT** STORE CONTAINERS FILLED WITH ACIDIC OR CAUSTIC SOLUTIONS, AS VAPORS FROM THESE MATERIALS WILL ATTACK THE CHAMBER INTERIOR AND ELECTRICAL COMPONENTS, THUS VOIDING THE WARRANTY.*

AVOID PLACING PLASTIC MATERIALS IN THE OVEN. EXTREME TEMPERATURES MAY CAUSE PLASTICS TO MELT, POSING A FIRE HAZARD. IF PLASTICS ARE PLACED IN THE OVEN, DO NOT LEAVE THE OVEN UNATTENDED.

Maintenance

WARNING

DISCONNECT OVEN FROM THE POWER SOURCE BEFORE PERFORMING ANY OF THE FOLLOWING STEPS:

Cleaning of Control Compartment:

Efficient and long life service of the oven depends on the physical condition of all the electrical components. Heavy accumulation of dirt or dust on the microprocessor controller, solid state relay, timer switch, circuit breaker switch, and the motor could cause these components to operate at higher than normal temperatures and premature failures may result. Therefore, periodically vacuum/blow dirt and dust off of these components.

Parts Replacement

There are five major electrical parts or assemblies on each oven:

1. Blower Motor
2. Heater Assembly
3. Microprocessor Controller
4. RTD Temperature Sensor
5. High Limit Thermostat

1. Blower Motor - With "Power" switch "On", blower motor should be operating. Open the oven door and air current from right to left can be felt within the chamber.

   The blower motor is equipped with a built-in thermal overload device to prevent it from overheating.

WARNING

DISCONNECT OVEN FROM ITS ELECTRICAL POWER SOURCE.

To replace the motor, it is first necessary to remove the heater.

a. Remove outside left panel from oven.

b. Remove wires from heater bus bars.

c. To gain access to the heater, remove left inner diffuser wall. Remove heater mounting screws.

d. Loosen set screw that locks blower wheel to shaft of motor and remove blower wheel.

e. Remove motor mounting bolts and carefully withdraw motor.

f. Replace motor in reverse order. The blower wheel must be positioned 1/4" from blower intake plate which is adjacent to the heater

.

2. Heater Assembly - Perform steps "a", "b" and "c" of motor replacement. Disconnect bus bars from old heater and attach to the new heater. Reassemble by reversing preceding steps.

WARNING

DISCONNECT OVEN FROM ITS ELECTRICAL POWER SOURCE.

3. Microprocessor Controller
   See illustration on page 16 (Models 605/625) or page 17 (Model 645).

a. Remove "Air Volume Control" knob by unscrewing counterclockwise.

b. Remove "High Limit" thermostat knob using a 5/64" allen wrench.

c. Remove six screws (8 for Model 645) securing access panel assembly to side of oven. Remove access panel. Note: Ground wire attached to access panel! Ground wire will retain access panel assembly! Be careful when removing access panel to avoid damaging ground wire!

d. Disconnect two mate and lock connectors (P1 & P2) from rear of control compartment by compressing tabs and pulling straight out.

e. From inside oven, remove three screws located on the front left edge.

f. While holding front panel from front side of oven, remove two screws located between door and front panel. Remove front panel/ control panel assembly.

g. Remove the six #8 sem nuts (8 for Model 645) securing control panel assembly to front panel.

h. Set control panel assembly face down, being careful not to damage the controller (protecting the front side is recommended - i.e. bubble wrap).

i. Disassemble the control panel housing by removing five screws; two on top, three on side. Remove "L" shaped cover.

j. Detach terminals, noting their location (see page 21 for proper connections).

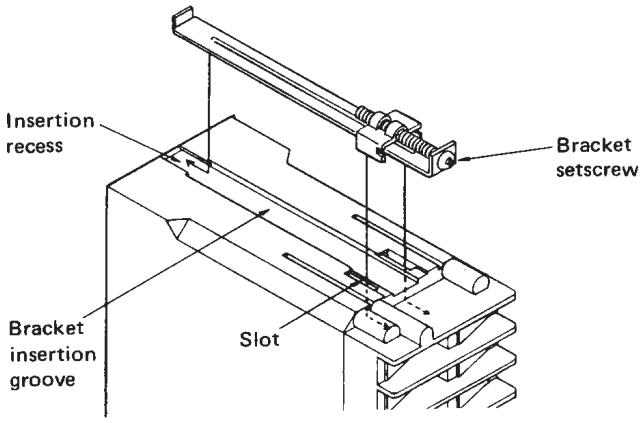
k. Remove the two sleeve mounting brackets located on top and bottom of the controller sleeve by unscrewing threaded shafts and pressing down on the bracket. (See "FIG. 1").

l. Slide controller forward through the front of the control panel.

m. Reverse this procedure to replace controller.

4. RTD Temperature Sensor - On all ovens, the sensor is located in the working chamber, close to the air exhaust vent. It is held in place by a tubular speed clip at the sensor end. The three leads terminate in a plug-in connector. To gain access to the connector, remove the outside left panel. Connector is located in the bottom left corner . To separate the connector, squeeze the housing ears and pull apart. To test sensor see "TROUBLESHOOTING" section page 10. To replace the sensor, it is also necessary to remove the rear panel.

   For proper unit operation and calibration, the sensor tip location is important. Insert a new sensor to the proper depth (see "FIG. 2"). Then pack glass wool insulation against the area where the wire leads protrude from the rear wall. Replace the rear and left outside panels.



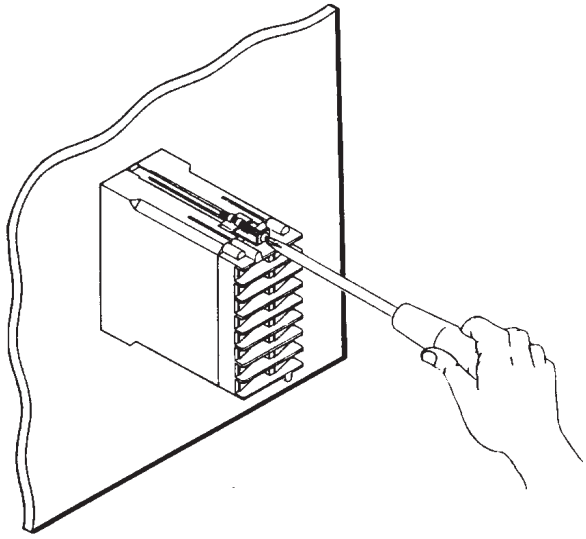


FIG. 1

Model	"A"
605	7"
625 645	9"

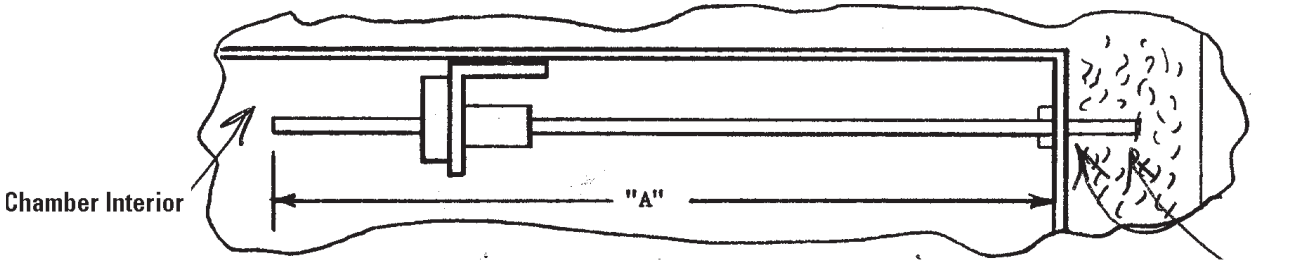


FIG. 2

5. "High Limit" Thermostat

CAUTION

OBSERVE THE FOLLOWING WHEN REPLACING THE THERMOSTAT ASSEMBLY.
BE SURE THERE IS NO CONTACT BETWEEN THE CAPILLARY AND PART OF THE HEATER COIL. CARE MUST BE EXERCISED WHEN HANDLING THE THERMOSTAT CAPILLARY, SINCE A SHARP BEND WILL CRIMP OFF THE HYDRAULIC OPERATING MEDIA.

a. Remove four screws from top hinge of door (left door on 645 ovens) and lift door off of bottom hinge.

b. Remove "Air Volume Control" knob by unscrewing (counter-clockwise).

c. Remove "High Limit" thermostat knob using a 3/32" allen wrench.

d. Remove eight screws from control panel.

e. Disconnect all wires from the thermostat.

f. Remove the two screws holding the thermostat to the chassis.

g. Remove left hand diffuser wall located inside of the oven.

h. Remove bracket that holds bulb of thermostat to top of oven and also, remove bracket from the capillary itself.

i. Remove outside left panel.

j. The thermostat can now be removed by pulling capillary out through the wall of the oven.

k. Reverse the preceding procedure to replace the thermostat.

Troubleshooting

CAUTION

SERVICE SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL. DISCONNECT THE UNIT FROM ITS ELECTRICAL SOURCE. DISCONNECTING ANY COMPONENT FROM THE CIRCUIT WITHOUT PRIOR REMOVAL OF THE POWER SOURCE MAY CAUSE DAMAGE TO OTHER CIRCUIT COMPONENTS.

To use this chart, find the applicable symptom and perform applicable checks and/or tests in the order they are listed (1 through 11).

Troubleshooting Chart												
Possible Causes/Test Procedure/Corrective Action												
SYMPTOMS	A	1	2	3	4	5		7		9		11
	B	1	2	3		5	6	7		9		11
	C	1	2	3		5	6	7		9	10	11
	D	1						7	8	9		11
	E	1				5		7	8	9	10	11

Symptoms

A. Temperature not uniform or fluctuating.
B. Temperature is being controlled at the wrong temperature.
C. Low heat (not reaching desired setpoint temperature, "SP").
D. Constant heat (overheating).
E. No heat.

Possible Causes/Test Procedure/Corrective Action:

1. Wiring (loose, broken or shorted):

   Improper wiring is listed first because it is applicable to all symptoms. It is not necessary to disassemble the oven and check all wiring and connections at the first indication of a problem. However, whenever you suspect a component is the cause of the problem, also check all wiring and connections associated with that component and/or problem).

2. Door/Gasket (Misaligned/Dirty):

   Heat Loss - Inspect door gasket to make certain it fits firmly against the chassis at all points. Replace if damaged.

3. Vent Shutter Cap:

   Make sure the vent shutter cap is not closed. Open to maximum (to maintain higher temperatures, vent shutter cap may have to be partially closed).

4. Loading:

   Test the unit when empty: if results are satisfactory, the chamber was improperly loaded. Redistribute the load.

5. "High Limit" Thermostat:

   a. Ensure "High Limit" is set as outlined in the "OPERATION" section.

   b. If the red pilot light is glowing at all times no matter the position of the "High Limit" knob (at ambient temperature), the "High Limit" is bad and should be replaced (See "PARTS REPLACEMENT", Page 7).

6. RTD Sensor:

If the display flashes □ □ □ □, check the sensor for a short circuit. If the display flashes ⌊ ⌊ ⌊ ⌊, check the sensor leads for loose connections or check the sensor for an open circuit.

Disconnect the RTD Sensor from terminals “15” and “16” at the rear of the microprocessor controller and compare the resistance of the sensor with the following chart. Also check the resistance between the sensor sheath and either sensor lead, it should be 100 megohms or greater.

The resistance values should be:

Sensor Temp. (°C)	Resistance (ohms)
50	119.40
100	138.50
150	157.32
200	175.84
250	194.08
300	212.03

7. Solid-State Relay:

With 3.5 to 26VDC between terminals (+)3 and 4 of the solid state relay (when the microprocessor controller's OUT 1 LED is glowing this voltage should be present, if not, check microprocessor controller), check for (AC) voltage between terminals 1 and 2 of the solid-state relay (it should be approximately 1-2 VAC).

Disconnect terminal (+)3 from the solid-state relay and verify that the voltage between terminals 1 and 2 = "LINE" voltage.

If you have approximately 1 VAC with terminal (+)3 disconnected or have "LINE" voltage with 3.5 to 26VDC present, replace the solid-state relay.

8. "CALIBRATION":

Perform "CALIBRATION" as outlined in the "CALIBRATION/TEMPERATURE OFFSET" section on page 6.

9. Heater Element(s):

The heater bus bar terminals are located in the left side compartment. Remove the outside left panel for access. A continuity check can be made on the heaters to ascertain whether broken or open. Remove one of the wires from a bus bar before taking measurement. There are two heater banks in parallel so a wrong value of resistance could indicate one of the banks is open.

The cold heater resistance should be approximately:

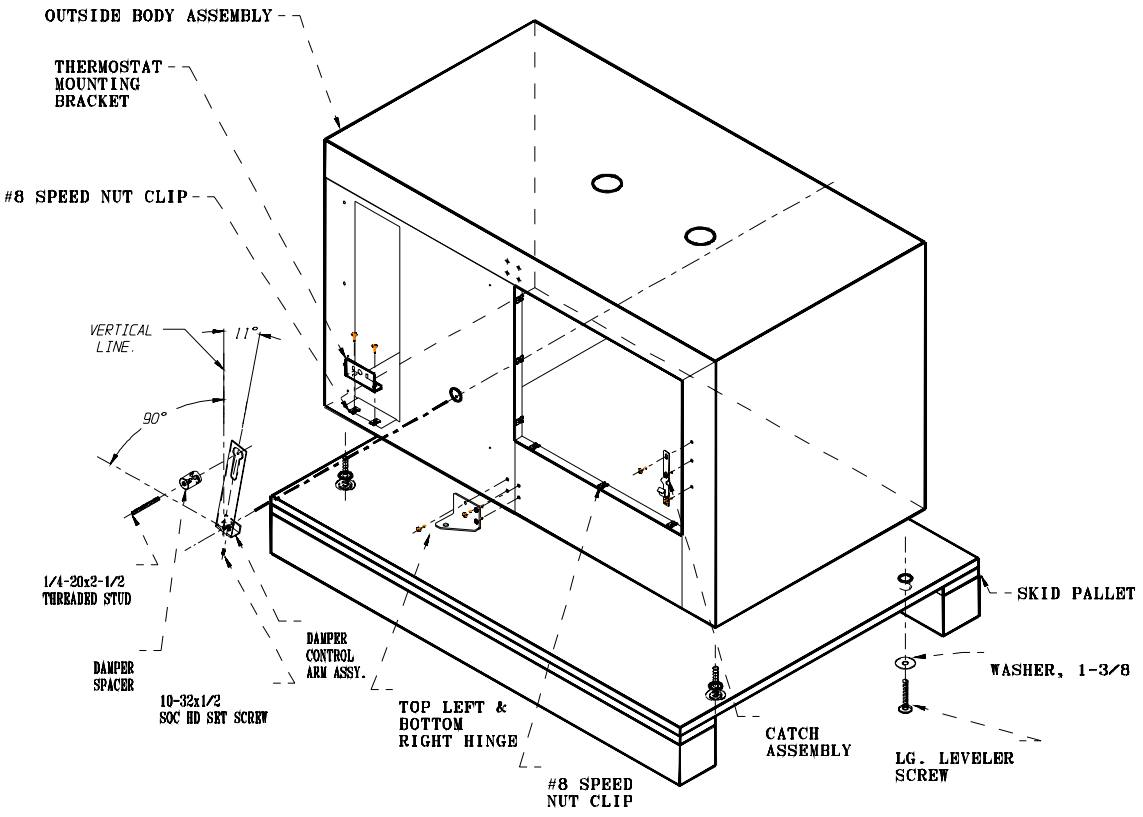
Model 605, 5.7 ohms for 115V/120V model
Model 605, 23 ohms for 208V/230V model
Model 625, 15 ohms for 208V/230V model
Model 645, 11.5 ohms for 208V/230V model

10. Microprocessor Controller:

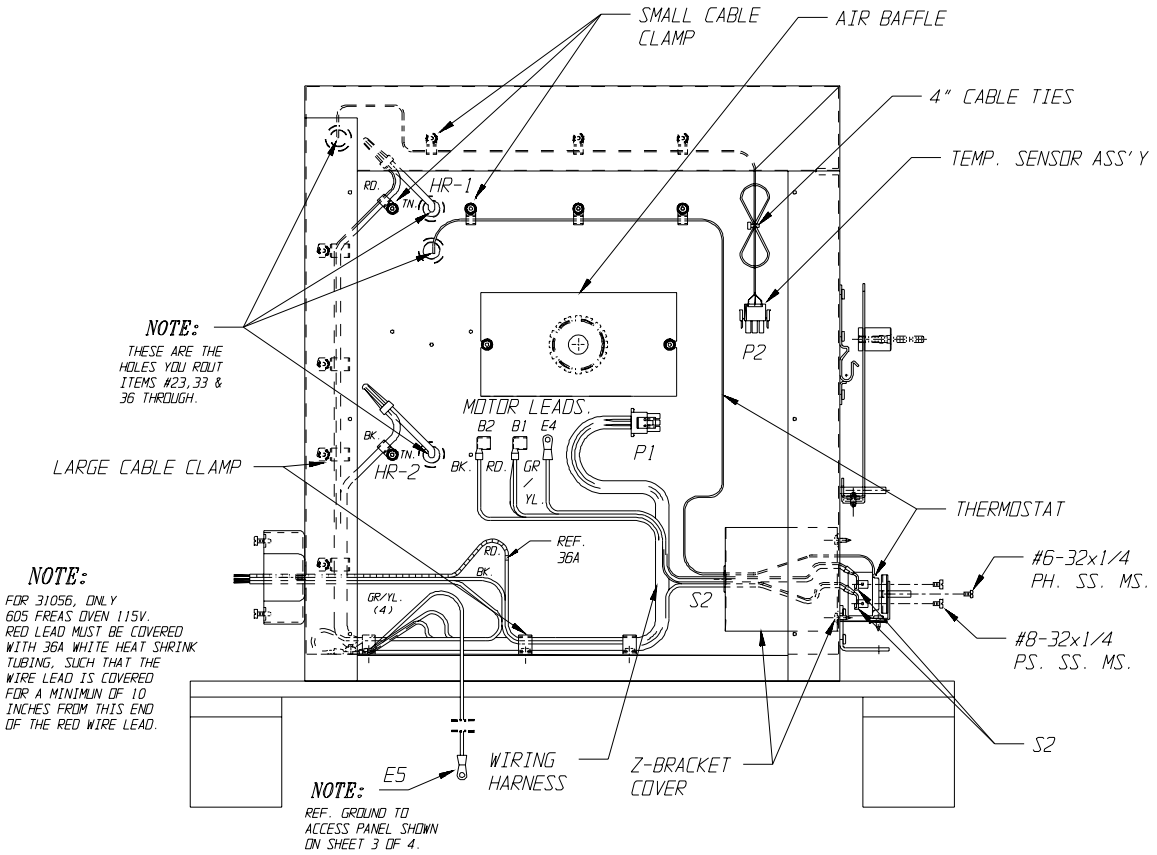
If all other components check out to be good and performing the "CALIBRATION OFFSET and "CALIBRATION" does not solve the problem, the controller should be replaced.

Model No.					
Catalog No.		**Volts**		**Hz**	**Phase**
Total Watts		**Total Amps**	**Blower Motor**	**Maximum Rated Temp (in °C)**	**6050/6051 6052/6053**
3166777		**120**	**50/60**	**1**	**2500**
20.8		**1/6 H.P.**		**325**	**3166778**
230		**50/60**		**1**	**2500**
11	**1/6 H.P.**	**325**			
6054	3166779	230			
50/60	1	3700	16		
1/6 H.P.	325	6056		3166780	230
50/60	1	4800	21		
1/6 H.P.	32	3175960	3175958	3175959	3175960
Heater	HR1	3175466	3175467	3175468	3175469
Sensor Ass'y., Temperature	RTD1	3167134			
Kit, "Timer"	S1	3167207			
Thermostat Kit, "High Limit"	S2	3167206			
Knob		3177535			
Relay, Solid State, 50 Amp	SSR1	3175535			
Shelf Kit		3166188		3166179	3166180
Latch & Catch		3167171			
Hinge Kit		3167211			
Leveling Screw Kit		3167208			
Gasket (Attached to Cabinet) (Sold by the foot)		3177536			
Vent Shutter Cap, Intake & Exhaust		3177386			
Door Assembly		3165349		3167081	3167078
Spacer, Damper		3177537			
RKC Controller		3176234			
Wiring Harness, Ctrl. Panel		3176342			
Wiring Harness, Main		3176343			
Door Handle		3164591			

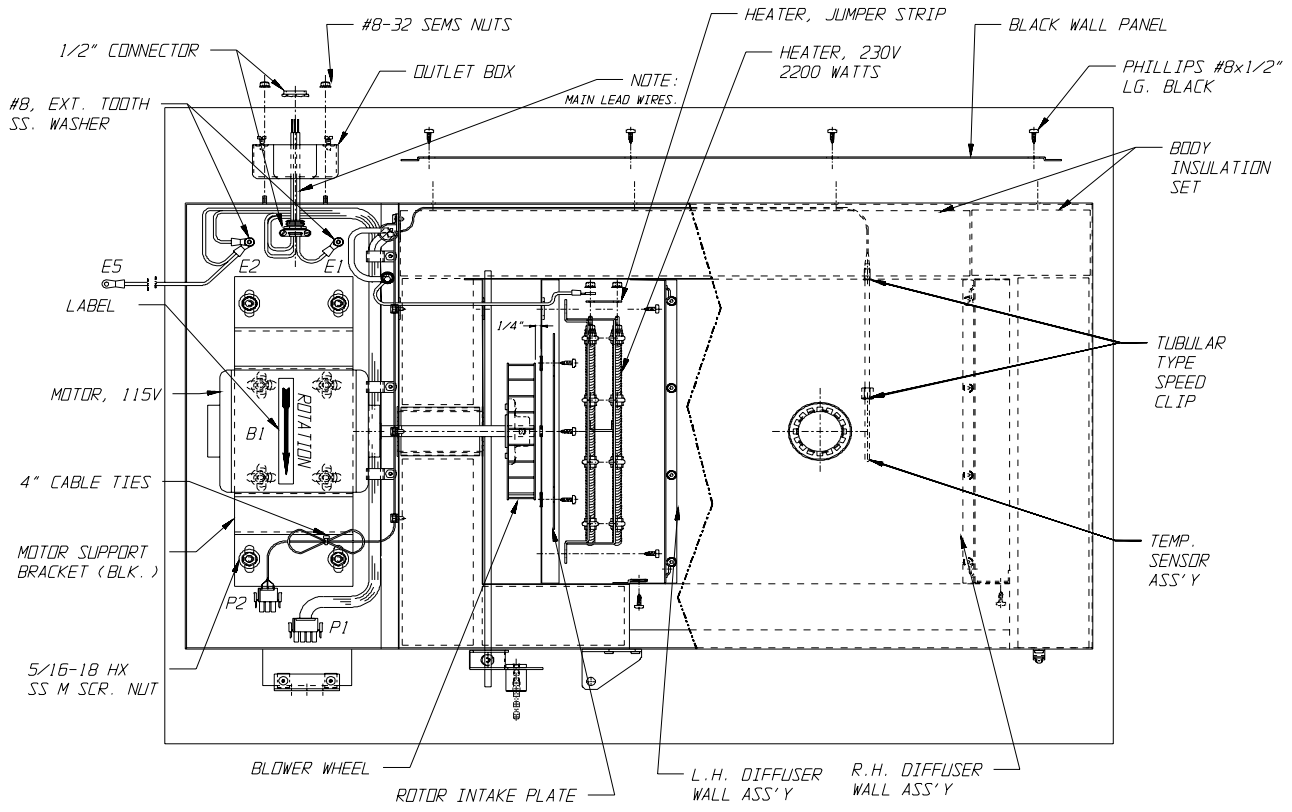
Assembly Drawings



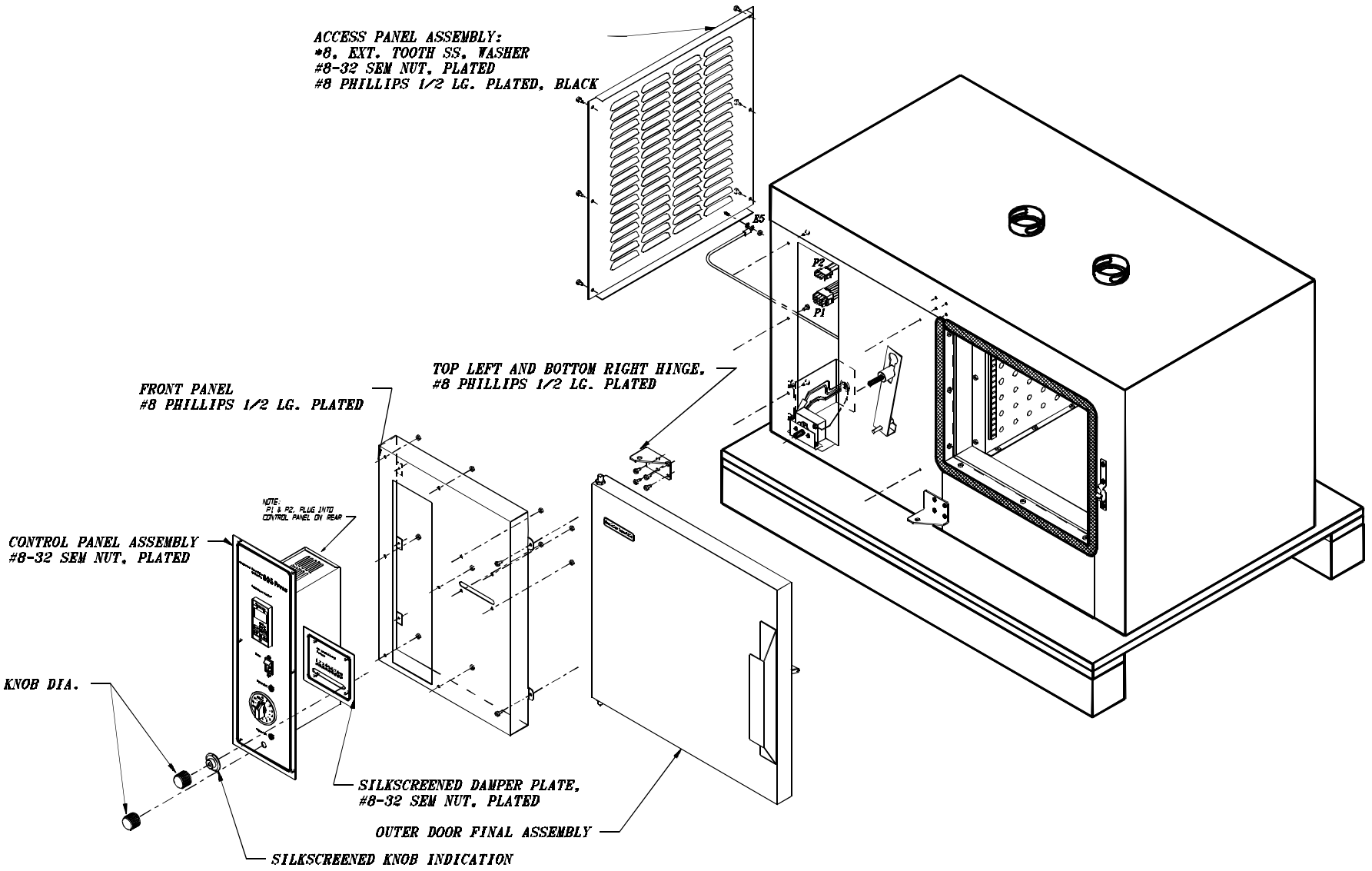
Models 605 & 625 Freas Oven



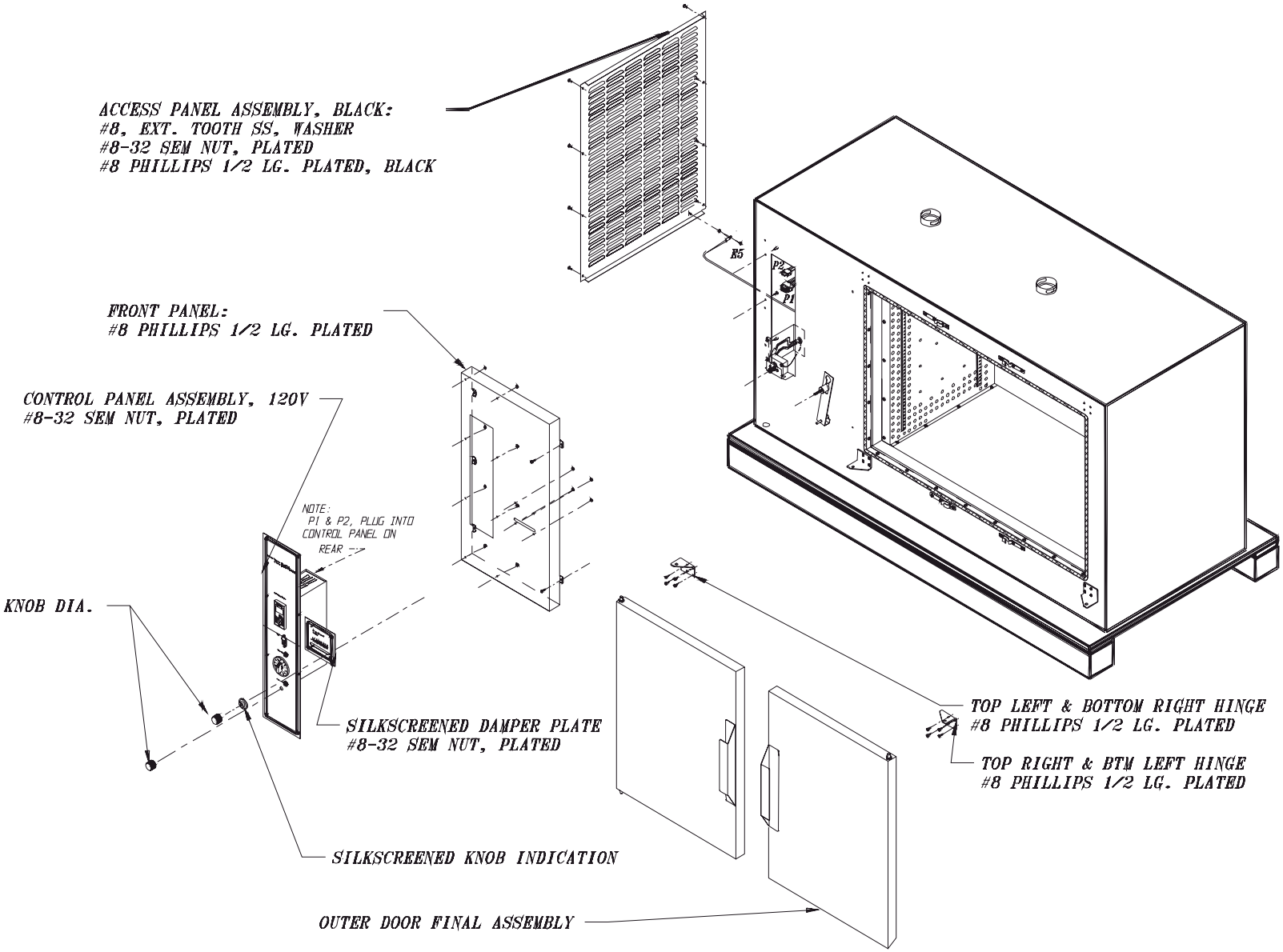
Models 605 & 625 Freas Oven



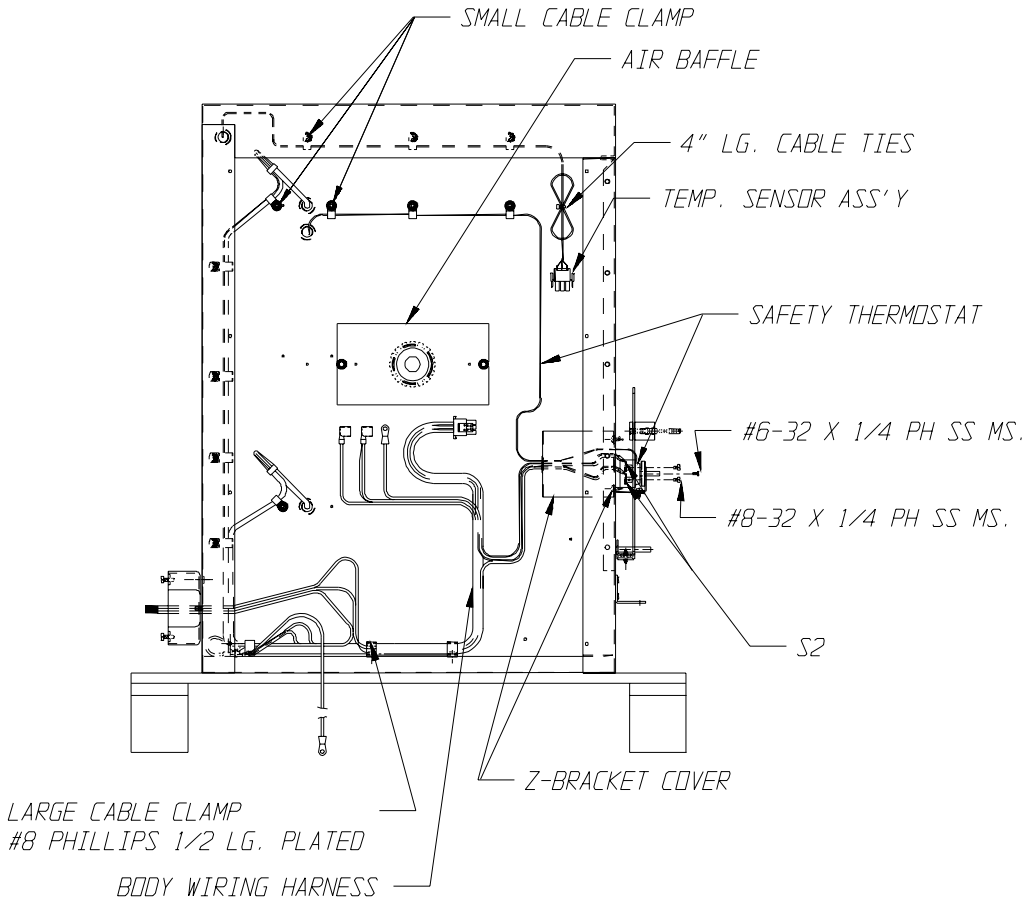
Models 605 & 625 Freas Oven



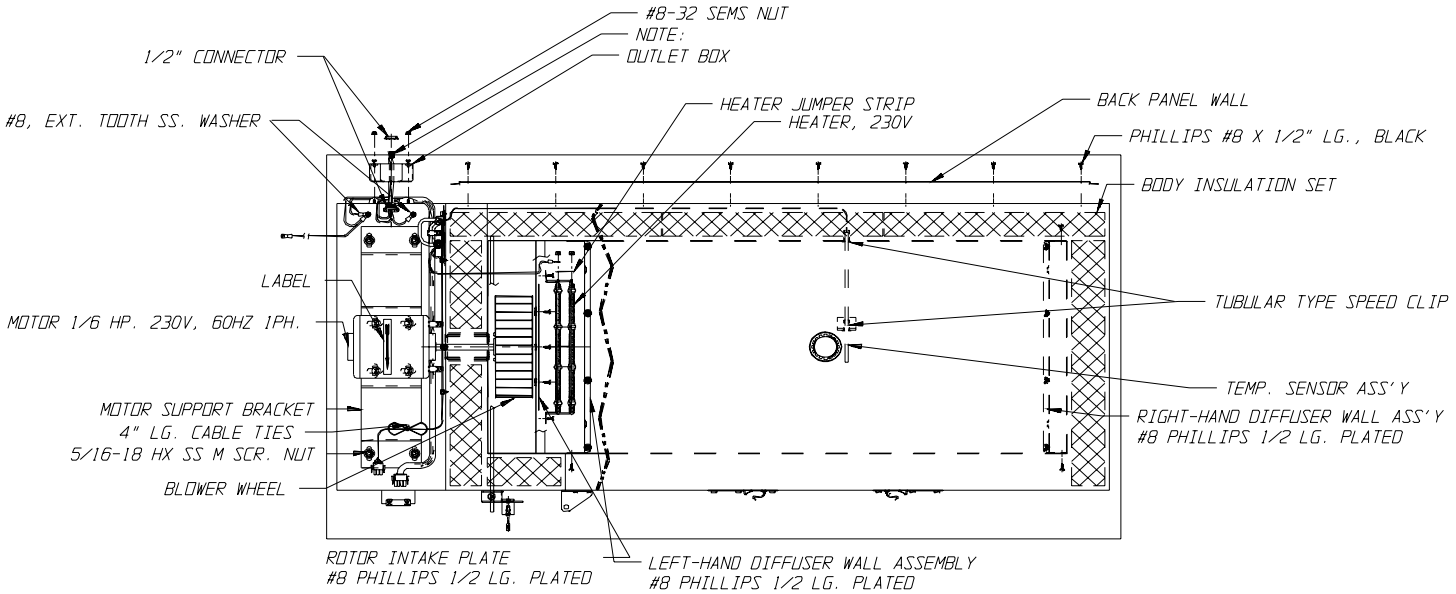
MODELS 605 & 625 FREAS OVEN



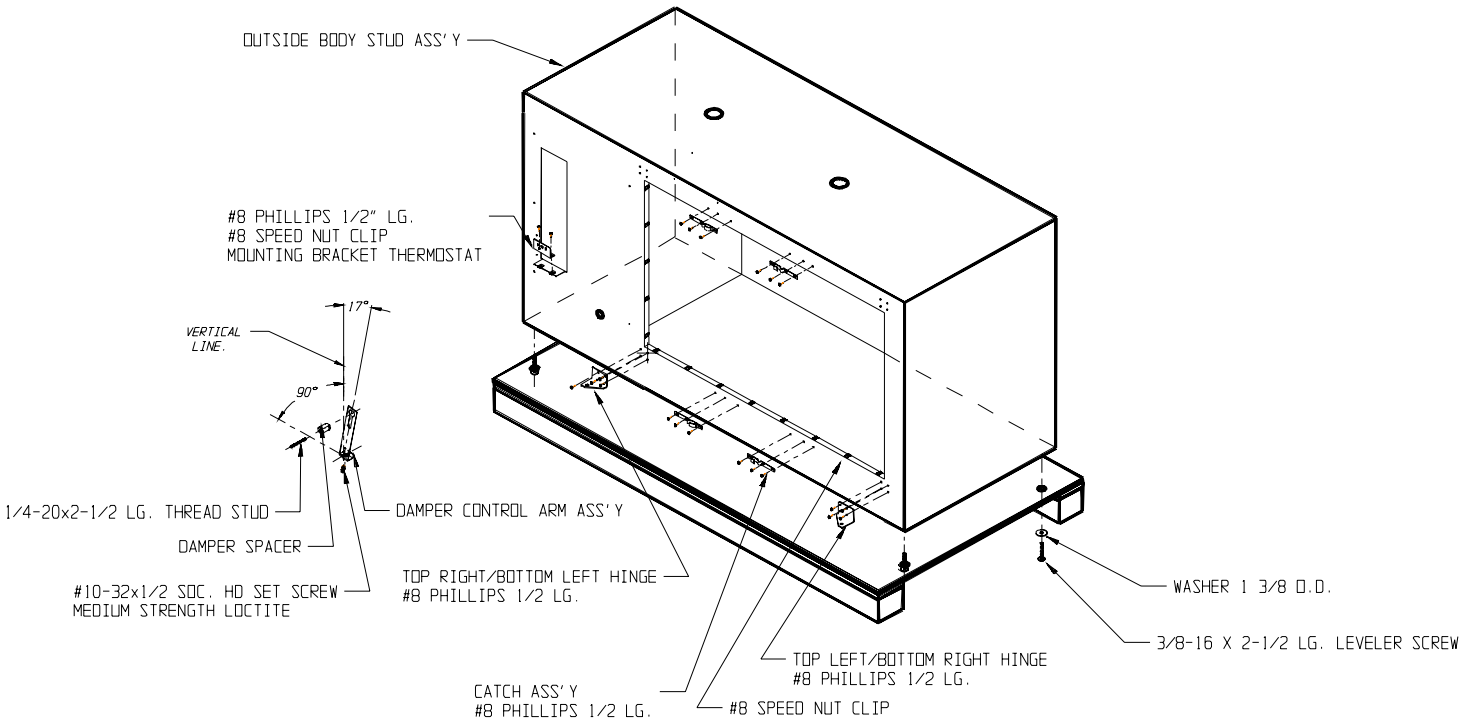
Model 645 Freas Oven



MODEL 645 FREAS OVEN

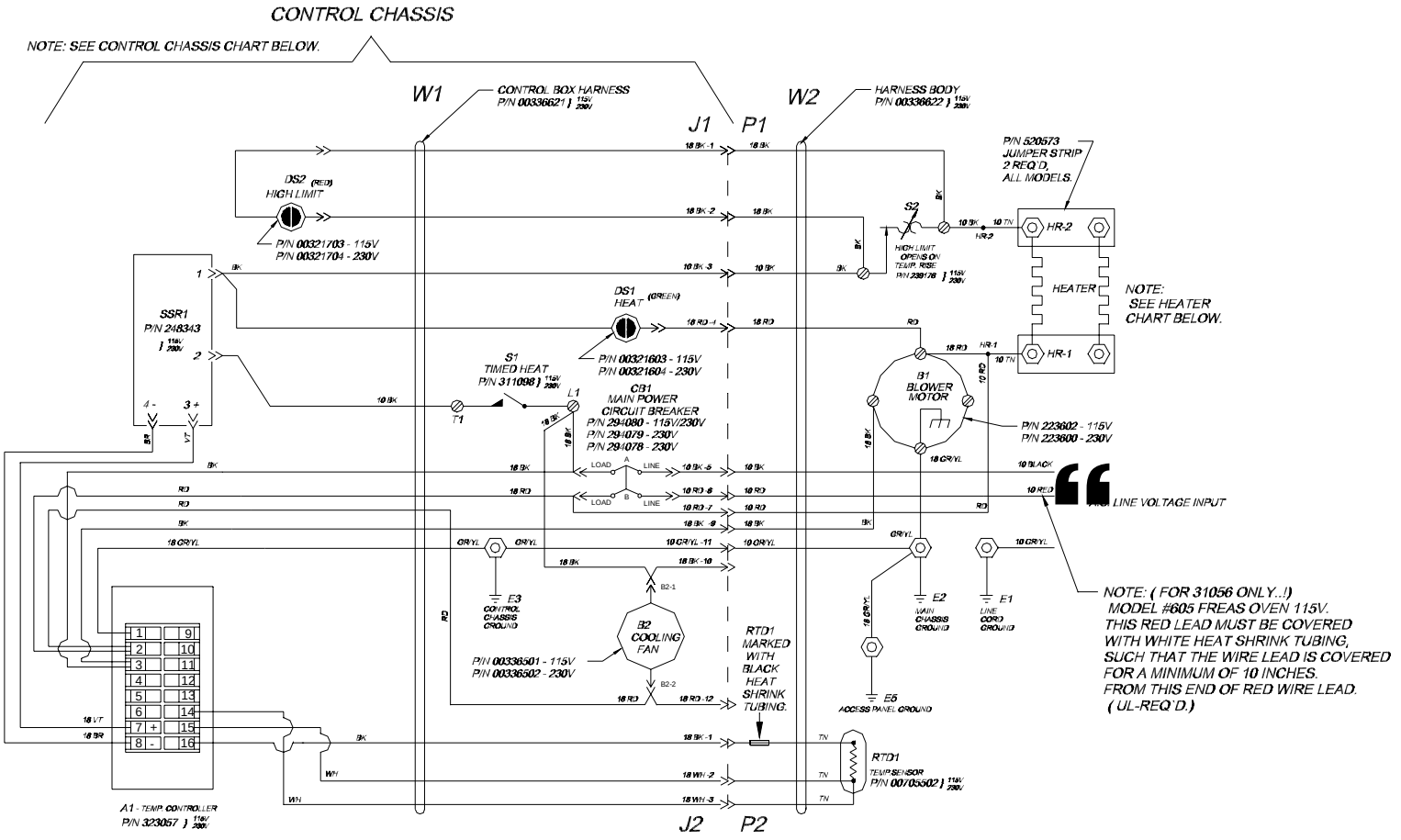


MODEL 645 FREAS OVEN



MODEL 645 FREAS OVEN

WIRING DIAGRAM FREAS OVENS, 115 & 230V.


CONTROL CHASSIS
NOTE: SEE CONTROL CHASSIS CHART BELOW.
W1
CONTROL BOX HARNESS P/N 00336621 } 115V 230V
W2
HARNESS BODY P/N 00336622 } 115V 230V
J1
P1
P/N 520573 JUMPER STRIP 2 REQ'D, ALL MODELS.
DS2 (RED) HIGH LIMIT
P/N 00321703 - 115V
P/N 00321704 - 230V
S2
HIGH LIMIT OPENS ON TEMP. RISE: P/N 238178 } 115V 230V
HR-2
HEATER
NOTE: SEE HEATER CHART BELOW.
HR-1
SSR1 P/N 248343 } 115V 230V
DS1 HEAT (GREEN)
P/N 00321603 - 115V
P/N 00321604 - 230V
S1 TIMED HEAT P/N 311098 } 115V 230V
T1
L1
CB1 MAIN POWER CIRCUIT BREAKER
P/N 294080 - 115V/230V
P/N 294079 - 230V
P/N 294078 - 230V
B1 BLOWER MOTOR
P/N 223602 - 115V
P/N 223600 - 230V
LOAD
LINE
A
B
"HOT" LINE VOLTAGE INPUT
NOTE: (FOR 31056 ONLY..!) MODEL #605 FREAS OVEN 115V. THIS RED LEAD MUST BE COVERED WITH WHITE HEAT SHRINK TUBING, SUCH THAT THE WIRE LEAD IS COVERED FOR A MINIMUM OF 10 INCHES. FROM THIS END OF RED WIRE LEAD. (UL-REQ'D.)
E3 CONTROL CHASSIS GROUND
E2 MAIN CHASSIS GROUND
E1 LINE CORD GROUND
E5 ACCESS PANEL GROUND
B2 COOLING FAN
P/N 00336501 - 115V
P/N 00336502 - 230V
RTD1 MARKED WITH BLACK HEAT SHRINK TUBING.
RTD1 TEMP.SENSOR P/N 007055021 } 115V 230V
A1 - TEMP. CONTROLLER P/N 323057 } 115V 230V
J2
P2

CONTROL CHASSIS CHART.			
CATALOG NO. FINAL ASSEMBLY.	MODEL NO.	PART NO. CONTROL PANEL ASSEMBLY.	VOLTAGE.
31056 & P	605	007154/0	115V
31057 & P	605	007154/2	230V
31058/31083	625 & 625S	007154/30	230V
31060	645	007154/50	230V

HEATER CHART.				
CATALOG NO. FINAL ASSEMBLY.	MODEL NO.	HEATER PART NO.	VOLTAGE.	WATTS.
31056 & P	605	247321	115V	2200
31057 & P	605	247322	230V	2200
31058/31083	625 & 625S	247323	230V	3300
31060	645	247324	230V	4400

THERMO ELECTRON CORPORATION STANDARD PRODUCT WARRANTY

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the first year warranty period.

During the first year, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. Installation and calibration are not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gaskets are excluded from this warranty.

Replacement or repair of components parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo Electron Corporation postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

If equipment service is required, please call your Technical Services Office at 1-888-213-1790 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service and special application. Outside the USA, contact your local distributor for warranty information.

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THERMO ELECTRON CORPORATION INTERNATIONAL DEALER WARRANTY

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the first year warranty period. Dealers who stock our equipment are allowed an additional six months for delivery and installation, provided the warranty card is completed and returned to the Technical Services Department.

During the first year, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. Installation and calibration are not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters, reagents, tubing, and gaskets are excluded from this warranty.

Replacement or repair of components parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

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